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Notices of New Fresh-Water Infusoria. By Alfred C. Stokes, M.D.

(Read before the American Philosophical Society, November 5, 1886.)

Mastigamæba longifilum, sp. nov. (Figs. 1, 2, 3, 4).

Animalcules repent, very soft and extremely changeable in shape, emitting from all parts of the surface simple lobate pseudopodia, or wave-like expansions of the sarcode; the single antero-terminal flagellum five times as long as the contracted body, about twice as long as the extended zooid; contractile vesicle single, anteriorly placed; nucleus subspherical, small, situated near the anterior extremity. Length, when contracted, $\frac{1}{2250}$ inch; extended, $\frac{1}{900}$ inch. Habitat—Standing water, among decaying vegetation.

The figures (1, 2, 3, 4) show four forms of the same interesting little amœboid creature. The movements are usually slowly repent, while the flagellum is quite active. The zooid not rarely glides forward without the protrusion of distinct pseudopodia, only changing the form of the body by irregular expansions and contractions, while on other occasions the unbranched obtuse pseudopodia extend from any or all points of the periphery.

Anisonema pusilla, sp. nov. (Fig. 5).

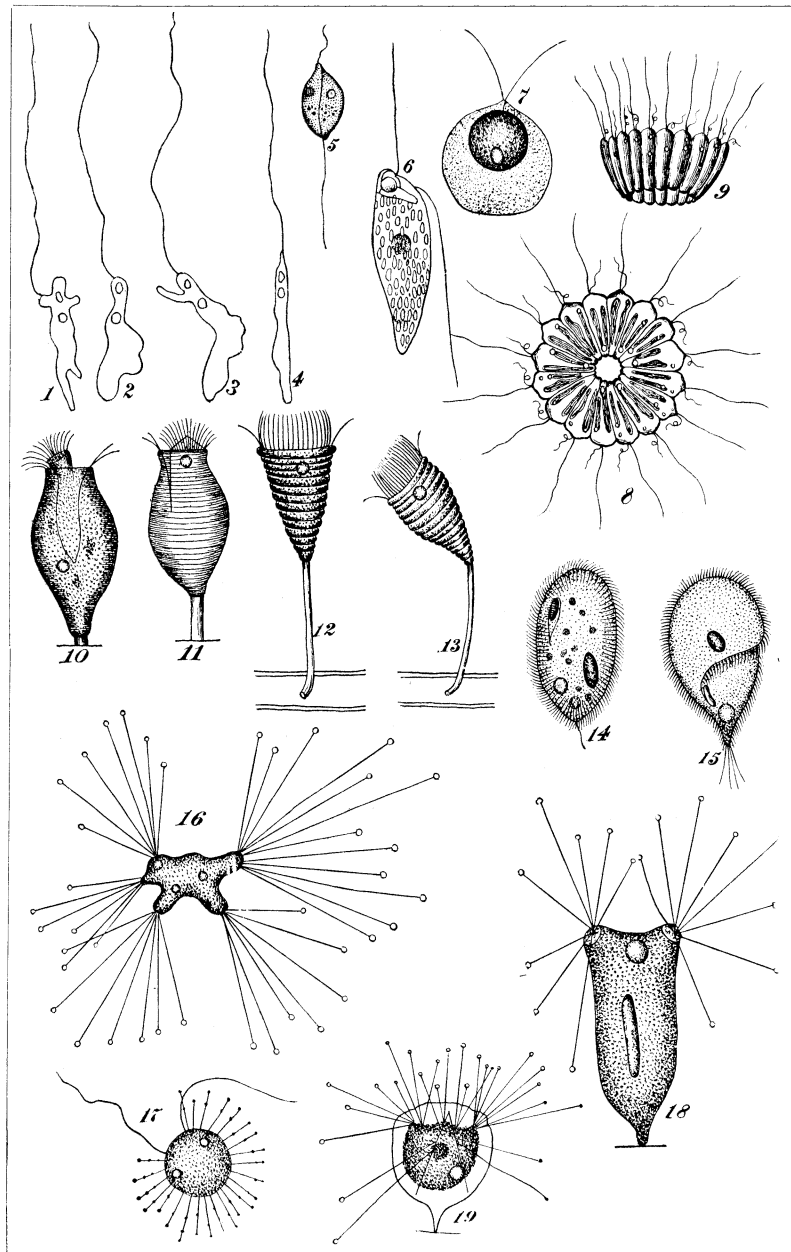
Body subelliptical, less than twice as long as broad, depressed, the two extremities narrowed and obtusely pointed, the ventral surface often slightly concave, the dorsal convex and longitudinally furrowed; anterior flagellum subequal to the body in length, the posterior or trailing appendage about three times as long as the zooid, both originating near together on the ventral aspect a short distance back of the frontal apex; pharyngeal passage minute, but distinct; contractile vesicle apparently single, subcentrally located; nucleus not observed; endoplasm frequently enclosing small dark particles, probably food fragments. Length of body $\frac{1}{2250}$ inch. Habitat—Pond-water. Movements oscillating, not rapid.

Trentonia, gen. nov.

Animalcules free-swimming, soft and somewhat changeable in shape, biflagellate, one flagellum trailing, one vibratile; frontal border slightly bilabiate; trichocysts not observed; otherwise as in *Raphidomonas* Stein.

Trentonia flagellata, sp. nov. (Fig. 6).

Body obovate, less than three times as long as broad, the anterior border oblique and somewhat bilabiate, the posterior extremity obtusely pointed; flagella subequal to each other and to the body in length, one extending arcuately forward, often rapidly and spirally vibrating, apparently originating in the oral fossa; the other taking its origin on the ventral or lower surface a short distance behind the anterior extremity,



Fresh-water Infusoria. Stokes.

usually trailing; oral aperture conspicuous, communicating with a capacious subtriangular pharyngeal cavity; contractile vesicle single, spherical, near the anterior extremity; nucleus subspherical, situated near the body centre; endoplasm enclosing numerous small ovate chlorophyll corpuscles forming a bright-green layer near the cuticular surface. Length of body $\frac{1}{430}$ inch. Movements rotary on the longitudinal axis, but not rapid. Reproduction by encystment and subsequent binary fission. Habitat—Pond-water.

This is very similar to *Raphidomonas semen* (Ehr.) Stein, with two flagella and no apparent trichocysts. When first observed, more than a year ago, it was without hesitation identified with the above-mentioned European form; but some evenings later, while again examining the Infusorians, it became evident that the specimens possessed two flagella, while the *Raphidomonas* has but one; otherwise they were identical with the form just named, with the exception of the trichocysts. Recently the same Infusoria have been collected in a locality remote from the first, and the previous observations confirmed.

The trailing flagellum is ordinarily extremely difficult to see. When the Infusorium is rendered uncomfortable and sluggish by prolonged confinement beneath the cover-glass, or partially poisoned by iodine, then the vibratile flagellum, which is usually held stiffly in advance, the tip alone trembling, is flashed into sight as a rapidly undulating spiral, and the trailing appendage is also momentarily directed forward. At other times it also becomes visible when the Infusorian is in certain positions or has assumed certain changes of form. How the careful European investigators could have overlooked this trailing appendage is inexplicable, providing, of course, that the present form is *Raphidomonas semen*, with which two flagella are now for the first time observed. It is scarcely possible to believe that Stein would have failed to notice so important an appendage. Yet these two forms are so nearly identical, with the exception of the biflagellate character of the present Infusorian, that I confer the generic title *Trentonia* provisionally only. If, after re-examination, the European *Raphidomonas* should prove to be monoflagellate, then will *Trentonia flagellata* become the type of a new family group necessarily taking the name Trentonidæ.

Cryptoglena truncata, sp. nov. (Fig. 7).

Lorica subspherical, depressed posteriorly, the anterior border rounded, the oral aperture slightly eccentric and somewhat conically projecting; the posterior margin truncate, often slightly retuse; the lower or ventral aspect gently concave, the dorsal convex; enclosed zoëid subspherical; endoplasm green; contractile vesicle double, anteriorly situated; amylaceous corpuscle single, subspherical and subcentrally located; lorica minutely punctate, colorless when young. Length $\frac{1}{1287}$ inch or less. Habitat—Pond-water. Movements rotary on the long axis.

The enclosed body varies much in size. It is usually small, occupying

but a very limited portion of the lorica cavity anteriorly, to which it is apparently in no way attached. Among the numerous individuals examined, none have been seen with the zoöid completely filling the cavity of the sheath, and but one in which the body even approached the posterior and lateral walls.

Cyclonexis, gen. nov. (κυκλος; νηξίς).

Animalcules laterally joined to form free swimming annular colonies, the zoöids illoricate; flagella two, one long, the other short, both vibratile; endoplasm enclosing two laterally disposed color-bands; eye-like pigment specks absent. Habitat—Fresh water.

This differs from *Uvella*, which it most closely resembles, in the lateral instead of a posterior union of the constituent animalcules, in the annular rather than a spheroidal form of the colony, and in the very diverse length of the two flagella.

Cyclonexis annularis, sp. nov. (Figs. 8, 9).

Colony composed of from ten to twenty zoöids, the posterior extremities of the constituent animalcules in young and small clusters occasionally in contact, in older and larger colonies remote, leaving a central more or less circular space; bodies obovate, compressed, about twice as long as broad, obtusely pointed anteriorly, rounded and narrowed posteriorly; long flagellum equaling or exceeding the body in length, the short appendage about one-half as long, usually convoluted spirally; contractile vesicle double, small, spherical, located in the anterior body-half, near one lateral border; color-bands yellowish. Length of body $\frac{1}{1800}$ to $\frac{1}{2250}$ inch; diameter of the annular colony $\frac{1}{900}$ inch or less. Movements rotatory. Habitat—Marsh-water, with *Sphagnum*.

Pyxidium urceolatum, sp. nov. (Fig. 10).

Body vasiform, less than twice as long as broad, widest centrally, constricted anteriorly, the posterior extremity narrowed to form a short colorless prolongation somewhat broader than the pedicel; cuticular surface smooth; peristome border truncate; ciliary disk but slightly exerted, ciliary circles two, long and fine; vestibulum large, extending to near the centre of the body; contractile vesicle in close proximity to the posterior part of the vestibule and apparently emptying into it; pedicel extremely short; the contracted zoöid ovate, posteriorly invaginate. Length of body $\frac{1}{215}$ inch. Habitat—Pond-water; on rootlets of *Lemna*.

Rhabdostyla invaginata, sp. nov. (Fig. 11).

Body vasiform, often slightly gibbous, about one and one-half times as long as broad, widest centrally, tapering posteriorly to the pedicel, and anteriorly to the slight constriction beneath the peristome; surface transversely striate; peristome border not revolute; ciliary disk prominent, conical, ciliary circles two; pedicel short, about two-fifths as long

as the body. Length of body $\frac{1}{750}$ inch. Habitat—Pond-water; attached to *Cypripis*.

The contracted body is ovate, and the pedicel is then invaginate within the posterior extremity, this margin of the zoöid coming into actual contact with surface of the object supporting the pedicel.

The characteristic conical form of the ciliary disk, either alone or in connection with the invagination of the pedicel by the contracted body, renders the species readily distinguishable from all other members of the genus.

Opisthostyla, gen. nov. ($\theta\pi\iota\sigma\theta\epsilon\varsigma$; $\sigma\tau\upsilon\lambda\omicron\varsigma$).

Animalcules resembling those of *Rhabdostyla*, but the rigid pedicel curved near its point of attachment to the submerged object, this part acting, when the zoöid is contracted, like a spring, and throwing the animalcule and the otherwise inflexible foot-stalk backward through the water, the whole immediately becoming upright by the recoil of the curved extremity of the pedicel. Inhabiting fresh water.

Opisthostyla annulata, sp. nov. (Figs. 12, 13).

Body conical-campanulate, slightly changeable in form, somewhat gibbous or the lateral margins nearly straight, the zoöid obliquely or vertically placed on the pedicel, less than twice as long as broad, strongly striate or annulate transversely; obovate when contracted; peristome border revolute, ciliary circles two; pedicel as long as the body, the distal extremity suddenly and shortly curved. Body and pedicel each $\frac{1}{1125}$ inch long. Habitat—Pond-water; attached to Algæ.

The short curve at the end of the pedicel at its point of attachment to the supporting object seems to act as a spring, as already stated, to assist the zoöid in throwing itself backward when the body contracts, the entire Infusorian then describing rather more than a semicircle in the water, having the point of attachment of the foot-stalk as the centre. The movement is usually very quickly accomplished, the return of the animalcule to its normally erect position being almost as suddenly achieved.

In the "Annals and Magazine of Natural History" for February, 1886, the writer described an Infusorian under the name *Rhabdostyla pusilla*, which is certainly a member of the new generic group here formulated. The following is an amended diagnosis of the form referred to:

Opisthostyla pusilla Stokes (*Rhabdostyla pusilla* Stokes *).

Body campanulate, tapering posteriorly, less than twice as long as broad, the surface transversely striate; peristome slightly exceeding the body-centre in width, the border revolute; contracted zoöid ovate; pedicel scarcely longer than the body, the distal extremity shortly and suddenly curved. Length of body $\frac{1}{1125}$ inch. Habitat—Pond-water; attached to *Ceratophyllum*.

* Annals and Magazine of Natural History, S. 5, Vol. xvii, p. 108, Pl. I, Fig. 17.

This differs from the preceding species of *Opisthostyla* in the more conical form and less strongly marked transverse furrows of the body, and in the greater proportionate length of the pedicel.

Colpoda depressa, sp. nov. (Fig. 14).

Body ovate, depressed, less than three times as long as broad, slightly widest anteriorly, the frontal border rounded, the right-hand side of the posterior margin slightly and obliquely truncate, the right-hand body-margin somewhat flattened, the left hand side convex; ventral surface flattened, slightly concave; cilia of the posterior border longest and most conspicuous, a single cilium occasionally longer than the others; oral aperture ventral, in the anterior body-half, on the right-hand side of the median line; the projecting ciliary tuft broad, the cilia fine and appearing like an undulating membrane; contractile vesicle single, spherical, in the posterior body-half on the right-hand side of the median line; the cuticular surface roughened by minute elevations arranged in longitudinal rows, except in the oral region, where a long obovate space is comparatively smooth; endoplasm colorless, granular; trichocysts numerous, arranged perpendicularly to the cuticular surface; nucleus ovate, subcentrally located; anal aperture ventral, on the right-hand side of the posterior extremity. Length of body $\frac{1}{300}$ to $\frac{1}{450}$ inch. Habitat—Standing water, with *Sphagnum*. Reproduction by transverse fission.

The most recently formulated generic diagnosis of *Colpoda* refers to the oral aperture as situated in a cleft like fissure, that orifice in the present form not being so placed but on the flattened ventral surface. It would therefore seem preferable to slightly modify the generic description so as to include the present Infusorian, rather than to form a new generic title upon a difference so slight, especially since the other essential characters are undoubtedly similar. In the previously known species trichocysts have not been observed, neither has the position of the anal aperture been recorded.

The form here referred to bears some affinity to *Anophrys*, but to admit it within that group a change would also be needed in the generic description.

Metopides acuminata, sp. nov. (Fig. 15).

Body obovate, about twice as long as broad, compressed, the frontal border rounded, the posterior extremity tapering from the body-centre and terminating in a conspicuous acuminate prolongation; the anterior body-half apparently folded obliquely across the ventral surface, the peristomal margin strongly ciliate and prolonged beyond the centre of the body to near the right-hand border; a tuft of long, fine setæ projecting from the posterior acuminations; nucleus broadly ovate or subspherical, placed near the body-centre; contractile vesicle single, near the posterior

extremity. Length of body, $\frac{1}{3\frac{1}{5}}$ inch. Habitat—Standing pond-water, with decaying vegetation. Movements rotary on the longitudinal axis.

Trichophrya sinuosa, sp. nov. (Fig. 16).

Body flattened, irregular in shape, the margins undulate and lobulate; tentacles fascicled, long, distinctly capitate, protruded from the marginal lobes, the clusters seldom exceeding five in number; contractile vesicles multiple, marginal; nucleus not observed. Length $\frac{1}{4\frac{1}{5}}$ inch. Habitat—Pond-water; attached by the entire lower surface to *Anacharis*. Movements slow.

This differs from *T. epistylidis* C. and L., in its much smaller size, and especially in the marginal arrangement of the tentacles. The latter are long, often three times the length of the body.

Acinetactis, gen. nov. (*Acineta*; ακτις).

Animalcules subspherical, soft and changeable in form, free-swimming or temporarily adherent, emitting from all parts of the surface capitate, ray-like pseudopodia; flagella two, vibratile, one temporarily adherent by its distal extremity. Inhabiting fresh water.

The single member of this previously undescribed genus differs from the *Actinomonas* of Saville Kent in the presence of two flagella and in the distinctly capitate character of the filamentous pseudopodia, the latter often being conspicuously pin-like in appearance. The existence of the temporarily adherent flagellum, in addition to the habitually vibratile appendage, necessitates not only the formation of a new generic title, but a new family group, for the reception of this singular creature, the name of the latter necessarily being *Acinetactidæ*.

Acinetactis mirabilis, sp. nov. (Fig. 17).

Body subspherical, soft and plastic, often emitting short lobate pseudopodia in addition to the fine, capitate rays projecting from all parts of the periphery, the last-named appendages usually bearing one or more minute supplementary protoplasmic globules in the course of the ray, in addition to the globule tipping the free extremity; rays occasionally exceeding the diameter of the body in length; flagella subequal, their length about twice the diameter of the zoöid, originating from the anterior border, but at some distance from each other; contractile vesicle double, situated on opposite sides of the anterior body-half; nucleus apparently subcentrally located and subspherical; endoplasm granular, especially posteriorly. Diameter of the body $\frac{1}{2\frac{1}{5}}$ inch. Habitat—Stagnant pond-water, among decaying vegetation. Movements rapid.

When in the free-swimming phase, the ray-like pseudopodia are usually confined to the posterior region of the body, or they may be entirely withdrawn, thus leaving the animalcule almost entirely smooth.

Acineta lacustris, sp. nov. (Fig. 18).

Lorica elongate-obovate or subvasiform, strongly compressed, less than three times as long as broad, widest anteriorly, the sides continuous across the frontal border, leaving a rounded lateral aperture at each angle for the exit of the tentacles; slightly constricted beneath the anterior border, and very moderately inflated near the posterior extremity, the frontal margin concave; pedicel very short and hollow; enclosed zoöid often entirely filling the entire cavity of the lorica; tentacles in two antero-lateral fascicles, distinctly capitate; contractile vesicle single, placed near the anterior border; nucleus elongate, vertical; endoplasm granular. Length of the lorica $\frac{3}{4}$ to $\frac{1}{4}$ inch. Habitat—Pond-water; attached to *Anacharis*.

Acineta stagnatilis, sp. nov. (Fig. 19).

Lorica subcircular in outline, rounded and inflated posteriorly, compressed anteriorly, the frontal border irregularly convex; pedicel short, hollow, from one-fourth to one-fifth as long as the lorica, widest at its junction with the sheath, tapering thence and terminating in a button-like point of attachment; frontal margin pierced by a slit-like fissure, and two anteriorly converging, narrow fissures on the front and rear walls, for the exit of the tentacles; the enclosed animalcule occupying the centre of the lorica, apparently not attached to the walls, subspheroidal, the anterior border truncate; tentacles more or less fascicled, capitate; contractile vesicle single, postero-lateral; endoplasm granular. Length of the lorica, including pedicel, $\frac{1}{4}$ inch. Habitat—Pond-water; on *Myriophyllum*.

EXPLANATION OF THE FIGURES.

Figs. 1-4. *Mastigamæba longifilum*; different forms of one individual.

Fig. 5. *Anisonema pusilla*, $\times 900$.

Fig. 6. *Trentonia flagellata*, $\times 430$; gen. et sp. nov.

Fig. 7. *Cryptoglena truncata*, $\times 772$.

Figs. 8, 9. *Cyclonexis annularis*, $\times 630$; front and side views; gen. et sp. nov.

Fig. 10. *Pyxidium urceolatum*, $\times 290$.

Fig. 11. *Rhabdostyla invaginata*, $\times 750$.

Figs. 12, 13. *Opisthnostyla annulata*, $\times 730$; gen. et sp. nov.

Fig. 14. *Colpoda depressa*, $\times 300$.

Fig. 15. *Metopides acuminata*, $\times 375$.

Fig. 16. *Trichophrya sinuosa*, $\times 255$.

Fig. 17. *Acinetactis mirabilis*, $\times 900$; gen. et sp. nov.

Fig. 18. *Acineta lacustris*, $\times 415$.

Fig. 19. *Acineta stagnatilis*, $\times 135$.